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Sir:

Please file the following enclosed patent application papers:

Applicant #1, Name: THOMAS D. MERRITT

Applicant #2, Name: \_\_\_\_\_

Title: FLUE GAS CONVERSION APPARATUS AND METHOD

Specification, Claims, and Abstract: Nr. of Sheets 15

Declaration: Date Signed: 12/29/99

Drawing(s): Nr. of Sheets Enc.: (In Triplicate): Formal: \_\_\_\_\_ Informal: 3

Small Entity Declaration Of Inventor(s)  SED of Non-Inventor / Assignee/Licensee

Assignment; please record and return; recordal fee enclosed.

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**Request Under MPEP § 707.07(j):** The undersigned, a pro-se applicant, respectfully requests that if the Examiner finds patentable subject matter disclosed in this application, but feels that Applicant's present claims are not entirely suitable, the Examiner draft one or more allowable claims for applicant.

Very respectfully,

Thomas Merritt

Applicant #1 Signature

Applicant #2 Signature

1985 N.E. 147th STREET

Address (Send Correspondence Here)

MIAMI, FLORIDA 33181

Address

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Signed: Thomas Merritt

Inventor

**In the United States Patent and Trademark Office**

First/Sole Applicant: THOMAS D. MERRITT

Joint/Second Applicant: \_\_\_\_\_

Title: " FLUE GAS CONVERSION APPARATUS AND METHOD "

**Small Entity Declaration—Small Business Concern**

I hereby declare that I am

the owner of the small business concern identified below:  
 an officer of the small business concern empowered to act on behalf of the concern identified below:

Name of Concern: PET PROJECTS INC.

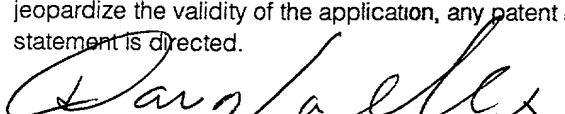
Address of Concern: 1985 N.E. 147th STREET MIAMI, FL 33181

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the above entitled invention of the above applicants and the specification filed herewith.

I acknowledge a duty to file, in the above application for patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.



Signature of Officer of Small Business Concern

12/29/99

Date

DOUGLAS J. COX PRESIDENT

Name and Title of Officer

11357 W. BISCAYNE CANAL RD.

Address of Officer

MIAMI, FLORIDA 33161

FLUE GAS CONVERSION APPARATUS AND METHOD

1    BACKGROUND OF THE INVENTION

2

3    Field of the Invention

4         The present invention relates to an apparatus and  
5 method of utilizing the flue gas mixture produced from  
6 burning fossil fuels, particularly the gaseous carbon  
7 dioxide constituent of the mixture, thereby eliminating the  
8 release of greenhouse gases into the earth's atmosphere.

9

10    Description of the Related Art

11         A recently discovered consequence of our industrial age  
12 is an increase of the concentration of carbon dioxide (CO<sub>2</sub>),  
13 a trace element in our Earth's atmosphere. It is known that  
14 just before the industrial revolution the CO<sub>2</sub> content of the  
15 atmosphere was 280 parts per million (ppm). In 1989 the CO<sub>2</sub>  
16 content was a little over 350 ppm. This increase in a  
17 relatively short period of time is an apparent indication  
18 that an overload condition exists upon elements which behave  
19 as natural sinks for this gas. These elements, namely the  
20 oceans, vegetation, and rocks have so far been able to  
21 function perfectly as natural sinks throughout the ages,  
22 having only been exposed to the natural occurring sources  
23 of carbon dioxide such as fires and volcanic sources.  
24 However this recent addition by anthropogenic sources, such  
25 as industrial processes which rely upon the burning of

1 fossil fuels, has increased the concentration of CO<sub>2</sub> in the  
2 atmospheric makeup to the point where certain adverse  
3 effects are now apparent. The most obvious effect is a  
4 phenomena known as "greenhouse effect", a potentially  
5 dangerous phenomena which if left unchecked could possibly  
6 reap catastrophic consequences upon the human race. This  
7 effect is theorized by climatologists to bring about a rise  
8 in the mean temperature of the worlds oceans, thereby  
9 melting polar ice and increasing the mean sea level of the  
10 oceans. In fact, recent independent studies by Russian and  
11 American scientists have shown that the prediction of  
12 temperature rises in the polar regions have been correct.  
13 Sonar readings from British submarines patrolling this  
14 region have shown the ice to be one third as thick in the  
15 last thirty years. The British have a legitimate concern as  
16 the local effect upon Britain will be Russian like winters,  
17 replacing the moderate winters of present times. Since the  
18 mid-nineteen eighties Eskimos have reported spring arriving  
19 one month early, and autumn arriving one month late. It is  
20 also theorized that this phenomena will result in a greater  
21 number and severity of hurricanes. In fact meteorologists  
22 at the Massachusetts Institute of Technology (MIT) have  
23 calculated a relationship between sea surface temperatures  
24 and the central low pressure of a tropical cyclone. It was  
25 shown the cyclone pressures could decrease substantially  
26 with increasing sea-surface temperatures. Increases of  
27 ocean temperatures of only a few degrees could increase the

1 intensity of hurricanes by as much as 40% based on typical  
2 greenhouse warming projections. In 1998 such a violent  
3 hurricane named "Mitch", caused the devastation of the  
4 entire infrastructure of the Central American country,  
5 Honduras, taking the lives of nearly twenty thousand people  
6 as well. A more recent event in November of 1999, which has  
7 officially been recorded as the most powerful cyclone to  
8 date, struck the nation of India killing twenty thousand  
9 people and left twenty million people homeless. Recent  
10 floods worldwide have been attributed to excess water vapor  
11 in the atmosphere, another predicted result of greenhouse  
12 effect. One such flood in December of 1999, the result of a  
13 torrential downpour, killed an estimated 35,000 people and  
14 left untold hundreds of thousands homeless in and around  
15 Caracas, Venezuela. It is only natural to assume the human  
16 and economic toll will only increase as time goes by with no  
17 effort made to reduce anthropogenic carbon dioxide  
18 emissions. It is entirely possible the effect will  
19 eventually evolve into a stage known as "runaway greenhouse"  
20 which will eliminate all Human life forms from the surface  
21 of the Earth. To the trained eye it is obvious an emergency  
22 situation is eminent.

23 Accordingly, with the demand for electric power  
24 increasing steadily worldwide, thereby increasing the  
25 amount of fossil fuels being burned, it is readily apparent  
26 some corrective measure must be taken to alleviate this  
27 situation. While converting all electric utilities to

1 nuclear power is completely unrealistic, there exists a need  
2 in the art for the emergence of fossil fuel burning electric  
3 power generation plants which possess the ability to contain  
4 all of the resultant emissions, and doing so while operating  
5 in an efficient manner. My previously issued U. S. Patents  
6 numbered 5,027,720, 5,129,331 and 5,265,424 address this  
7 issue to some extent. However, these designs do not  
8 adequately address the final disposition of the enormous  
9 quantities of carbon dioxide produced by a fossil fuel  
10 burning furnace boiler. The inventive system disclosed  
11 herein will create useful products from the resultant flue  
12 gases. Thus no harmful exhaust gases are permitted to  
13 escape into the atmosphere, overcoming the disadvantages of  
14 the prior art, and providing a much needed solution to a  
15 difficult environmental dilemma.

16

17 SUMMARY OF THE INVENTION

18

19 It is the object of the present invention to provide an  
20 apparatus and method for recycling the flue gases which  
21 result from the burning of fossil fuels, whereby the  
22 constituent flue gas, carbon dioxide, is prohibited from  
23 entering the earth's atmosphere.

24 It is a further object of the invention to utilize a  
25 constituent of the flue gas, namely carbon dioxide, as the  
26 actual source of power in the process of converting it to a  
27 useful product.

1        It is yet another object of the invention to create  
2 other useful products from the flue gases whereby the energy  
3 penalty of operating the apparatus will be minimized.

4        The objects of the present invention are fulfilled by  
5 providing a means and method for extracting and recycling  
6 the resultant flue gas stream caused by the burning of  
7 fossil fuels such as coal, oil, and natural gas. Included  
8 are flue gas cooling and conditioning means. Further  
9 included is a fluid conduit means to direct the flow of the  
10 fluid process throughout the entire system.

11       Flue gas exits a source which in this example is a  
12 furnace boiler system, passing through cyclones to eliminate  
13 particulate matter. If natural gas or oil is the fuel being  
14 burned, the cyclones are not necessary. Assuming the  
15 combustion in the furnace boiler is under stoichiometric  
16 conditions, the approximate temperature of the flue gas  
17 exiting is 355 degrees Fahrenheit. The flue gas which is a  
18 mixture of N<sub>2</sub>, CO<sub>2</sub>, S<sub>2</sub>, and O<sub>2</sub> is then subjected to various  
19 stages of heat exchange, cooling and conditioning until the  
20 carbon dioxide and nitrogen are the only remaining  
21 constituents. If coal is the fuel being burned the remaining  
22 mixture is nitrogen (N<sub>2</sub>), oxygen (O<sub>2</sub>) and CO<sub>2</sub>, with the  
23 ratio of N<sub>2</sub> to CO<sub>2</sub> approximately 3:1 in favor of N<sub>2</sub>. If  
24 natural gas is the fuel then the remaining gas mixture is  
25 N<sub>2</sub>, and CO<sub>2</sub>. Carbon dioxide is separated from the mixture.  
26 It should be noted that this operation generally poses a  
27 high energy penalty, conversely the mixture will be

1 disassociated in a proprietary process of low energy  
2 consumption not within the scope of this patent application.  
3 Having separated the mixture, the nitrogen of which an  
4 enormous quantity exists, is saved for sale and other uses.  
5 The gaseous carbon dioxide is introduced into a laser  
6 powered gas converter. The carbon dioxide is utilized as a  
7 reactant in the converter wherein it is converted into a  
8 hydrocarbon fuel product. The converter is powered by a  
9 flowing gas laser otherwise known as a gas dynamic laser,  
10 and utilizes in its operation a purified portion of the  
11 carbon dioxide from the source. Such a laser is  
12 manufactured by United Technologies Inc. and is marketed for  
13 industrial uses. The completely assembled gas converter  
14 apparatus comprises a means to create a powerful infrared  
15 laser beam, and at least one but preferably a plurality of  
16 catalytic converters. Any variety of chemical compounds can  
17 be created by the converter from selected gases introduced  
18 into the device depending upon which catalyst is utilized.  
19 The infrared laser beam is passed through a beam splitter  
20 forming two beams. In this manner the beam radiates two  
21 catalytic converters simultaneously. It should be  
22 understood that the beam can be split into several beams and  
23 a separate task in another vicinity, such as communications,  
24 can be performed with the beam. Other tasks normally  
25 associated with a laser can also be performed. The above  
26 summary has described the actual creation of a producer gas  
27 fuel as well as other useful products from the emissions of

1 a furnace boiler system. Further, utilizing a constituent  
2 of the flue gas as the medium in a laser, then as a reactant  
3 within a catalytic converter radiated by the laser, is in  
4 essence utilizing carbon dioxide to convert itself into  
5 fuel, producing a new and surprising result.

6

7 BRIEF DESCRIPTION OF THE DRAWINGS

8

9 The above and yet other objects of the present  
10 invention and the attendant advantages will become more  
11 readily apparent by reference to the drawings wherein:

12 Figure 1 is a schematic block diagram indicating  
13 interconnected functional components and their positions  
14 relative to the inventive system.

15 Figure 2 is a schematic diagram depicting the  
16 preferred embodiment of the instant invention.

17 Figure 3 is a partial cutaway view of a second  
18 embodiment of inventive system comprising a single laser  
19 powered converter element.

20

21 DETAILED DESCRIPTION OF THE INVENTION

22 With reference to figure 1 a flue gas source 10 is  
23 depicted including furnace 11 wherein fuel mixed with air  
24 and burned. The conventional components of the furnace are  
25 shown as boiler superheater 12, steam turbine 13,  
26 intermediate turbine 13', secondary superheater 14,  
27 condenser 15, economizer 16, and air heater 17. The

1 resultant flue gas is made to enter cyclone 18 wherein  
2 particulate matter is removed. If the fuel being burned is  
3 not coal, then 18 can be eliminated. Induction fan 19 draws  
4 the flue gas, which has a temperature of approximately 355  
5 degrees Fahrenheit, out of the furnace and forces it into  
6 high temperature heat exchanger 21. Heat exchanger 21 which  
7 uses water as the exchange medium lowers the temperature of  
8 the gas to approximately 175 degrees Fahrenheit while  
9 simultaneously producing steam to drive lithium bromide  
10 chiller 20 which in turn produces forty degree water.  
11 Chiller 20 consumes .006% of power plant output (PPO). Upon  
12 exiting the heat exchanger the flue gas proceeds to a  
13 fibrous organic waste filter means 27 wherein the flue gas  
14 at a temperature of approximately 175 degrees Fahrenheit  
15 conditions an organic waste mixture, preparing the mixture  
16 for digestion in biogas production unit 30. The biogas  
17 production unit otherwise known as a methane digester  
18 produces methane gas which is extracted and consumed in fuel  
19 cell 31 thereby producing electricity. Other methods of  
20 utilizing the fuel can be employed. The fuel cell  
21 electrical production is equivalent to 1.1% of PPO and is  
22 intended to offset the penalty of operating the entire flue  
23 gas conversion system. The biogas production unit also  
24 converts the spent fibrous organic waste into enormous  
25 amounts of topsoil. Upon leaving the organic waste filter  
26 means 27 the flue gas is cooled by pond water in heat  
27 exchanger 29 in order to remove the water contained in the

1 gas. This stage consumes 0.28% of PPO and removes 100% of  
2 H<sub>2</sub>O plus 10% of SO<sub>2</sub> from the gas. The water now containing  
3 SO<sub>2</sub> is directed to sulfur recovery unit 26 where the sulfur  
4 is removed. The water is reused. Upon leaving the heat  
5 exchanger the temperature of the gas is approximately 150  
6 degrees Fahrenheit. The gas now enters the low temperature  
7 heat exchanger 22 where it is cooled to approximately 60  
8 degrees Fahrenheit. This heat exchanger uses the forty  
9 degree water produced in chiller 20 as the exchange medium.  
10 Immediately thereafter the gas is subjected to an open spray  
11 heat exchanger 23 using pond water as the medium of exchange  
12 and wherein the remainder of the sulfur dioxide is removed.  
13 The sulfur laden water is sent to a sulfur recovery unit 26  
14 where the sulfur is removed and the water returned to the  
15 pond. If natural gas is the fuel as illustrated in figure 1  
16 then the remaining gas mixture is already CO<sub>2</sub>, and N<sub>2</sub>,  
17 therefore no heat exchanger 23 or sulfur removal component  
18 26 is required. If coal is being burned in the furnace, the  
19 remaining mixture consists of nitrogen (N<sub>2</sub>), oxygen (O<sub>2</sub>),  
20 and CO<sub>2</sub>, the ratio between N<sub>2</sub> and CO<sub>2</sub> approximately 3:1, N<sub>2</sub>  
21 predominating. A gas separation means 25 now receives the  
22 mixture wherein the nitrogen is removed and stored in vessel  
23 50 for sale or other uses. The remaining gas, now a  
24 significantly pure form of carbon dioxide, enters gas  
25 converter 40 where it is converted to carbon monoxide. With  
26 reference to figure 2 the converter 40 is comprised of a  
27 flowing gas infrared laser 41, and a first catalytic

1 converter 42. The flowing gas laser includes a gas inlet  
2 41a and a gas outlet 41b. Carbon dioxide gas flowing  
3 through laser 41 exits at gas outlet 41b and is directed  
4 through interconnection means 35 which is in communication  
5 with the inlet of converter 42. By entering converter 42  
6 the expended laser medium joins the main stream of carbon  
7 dioxide gas entering converter 42 as well. In this manner a  
8 portion of the actual gas used as the reactant in the  
9 catalytic converter is first utilized as a medium for the  
10 creation of the laser beam. With further reference to  
11 figure 2 beamsplitter 41c, splits the laser beam into  
12 multiple separate beams thus allowing laser 41 to  
13 accommodate a plurality of catalytic converters. Other  
14 distinct tasks normally associated with a laser are possible  
15 by spitting the beam, apart from the primary function which  
16 is to provide an energy source for catalytic conversion.  
17 The laser, otherwise known as a "Gas Dynamic Laser" is of a  
18 type manufactured by United Technologies Inc., and is  
19 marketed for industrial use. Given the amount of carbon  
20 dioxide available, an enormously powerful beam can be  
21 created. It is noted here that a plurality of converter 40  
22 may be utilized depending upon the quantity of gas to  
23 process. During operation carbon monoxide is produced in a  
24 first catalytic converter 42 by passing carbon dioxide over  
25 the laser heated catalyst carbon, the chemical equation  
26 being  $\text{CO}_2 + \text{C} = 2\text{CO}$ . Other suitable catalysts can be  
27 substituted. Hydrogen is produced in a second catalytic

1 converter 43 by passing steam over the catalyst iron, which  
2 is heated by the powerful laser beam created by laser 41,  
3 the chemical equation being  $4H_2O + 3Fe = Fe_3O_4 + 4H_2$ . Here  
4 again other suitable catalysts may be substituted. The  
5 produced gases are then introduced through compressor 44  
6 into mixer 45 where they are chemically combined, thereby  
7 producing a hydrocarbon fuel product. The mixer 45 may  
8 embody a separate catalytic converter. The product of the  
9 reactants is then stored in vessel 55 for the purpose of  
10 burning in the furnace boiler. Since each of converter  
11 element 42 and 43 can be constructed with a plurality of  
12 inlet connection points, another similar technique to  
13 manufacture a hydrocarbon fuel product with the apparatus  
14 can be employed. This method involves passing both steam  
15 and carbon dioxide over a select catalyst of a singular  
16 converter element of the reformer 40, thereby resulting in  
17  $CO + H_2$  a well known gaseous fuel. Furthermore, the elements  
18 Hydrogen, Carbon, Sulfur, Nitrogen, and Oxygen, all of which  
19 are mentioned in the foregoing specification, are all  
20 capable of being chemically combined in one way or another.  
21 Thus, the creation of a myriad of other useful products  
22 from the combination of these elements is another distinct  
23 possibility.

24 Accordingly, while a preferred embodiment of the  
25 present invention is shown and described herein, it will be  
26 understood that the invention may be embodied otherwise than  
27 as herein specifically illustrated or described, and that

1 within the embodiments certain changes in the detail and  
2 construction, as well as the arrangement of the parts, may  
3 be made without departing from the principles of the present  
4 invention as defined by the appended claims.

5 Now that the invention has been described,

6

7 What is claimed is:

8 1. A flue gas conversion apparatus comprising in  
9 combination:  
10 (a) a laser for the purpose of creating a laser beam  
11 (b) a catalytic conversion means, said means including  
12 at least one fluid inlet and at least one  
13 fluid outlet  
14 whereby said laser beam will cause a substantial  
15 temperature increase of said catalytic conversion  
16 means.  
17  
18 2. The apparatus recited in claim 1 wherein said laser  
19 comprises a carbon dioxide laser.  
20  
21 3. The apparatus recited in claim 2 further comprising a  
22 plurality of said catalytic conversion means  
23  
24 4. The apparatus recited in claim 3 further including a  
25 means to split said laser beam into a plurality of  
26 beams whereby at least one element of said split beam

1 can be directed to at least one of said plurality of  
2 said conversion means.

3

4 5. The apparatus recited in claim 4 wherein said carbon  
5 dioxide laser is a flowing gas carbon dioxide laser,  
6 said laser including a fluid inlet and a fluid outlet,  
7 whereby gaseous carbon dioxide is permitted to enter  
8 said laser, flow through said laser, and exit said  
9 laser.

10

11 6. The apparatus recited in claim 5 further comprising  
12 fluid interconnection means, permitting said fluid  
13 exit of said laser to interconnect with at least one  
14 of said fluid inlet of at least one of said conversion  
15 means, whereby said flowing gas of said laser is first  
16 utilized as a medium for creating a laser beam, said  
17 medium then utilized as a reactant in said catalytic  
18 converter.

19

20 7. The apparatus recited in claim 4 further comprising a  
21 chemical combining means disposed in fluid  
22 communication with said gas exit ports of said  
23 plurality of said catalytic conversion means wherein  
24 converted gas produced in each of said catalytic  
25 converters is chemically combined, thereby producing a  
26 fuel product.

27

1       8. The method of producing a hydrocarbon fuel from the  
2            flue gas produced from the burning of fossil fuels  
3            comprising the steps of:  
4            (a) utilizing the carbon dioxide constituent of the  
5              flue gas as a medium in a carbon dioxide laser,  
6              creating a laser beam  
7            (b) heating a select catalyst within a first  
8              catalytic converter with the laser beam  
9            (c) utilizing the carbon dioxide constituent exiting  
10             the laser as a reactant within the first  
11             catalytic converter, thereby producing carbon  
12             monoxide  
13            (d) heating a select catalyst, within a second  
14             catalytic converter by use of the laser beam  
15            (e) utilizing steam as a reactant within the second  
16             catalytic converter, thereby producing hydrogen  
17            (f) chemically combining the produced gases  
18             carbon monoxide and hydrogen, thereby producing a  
19             hydrocarbon fuel product.

20

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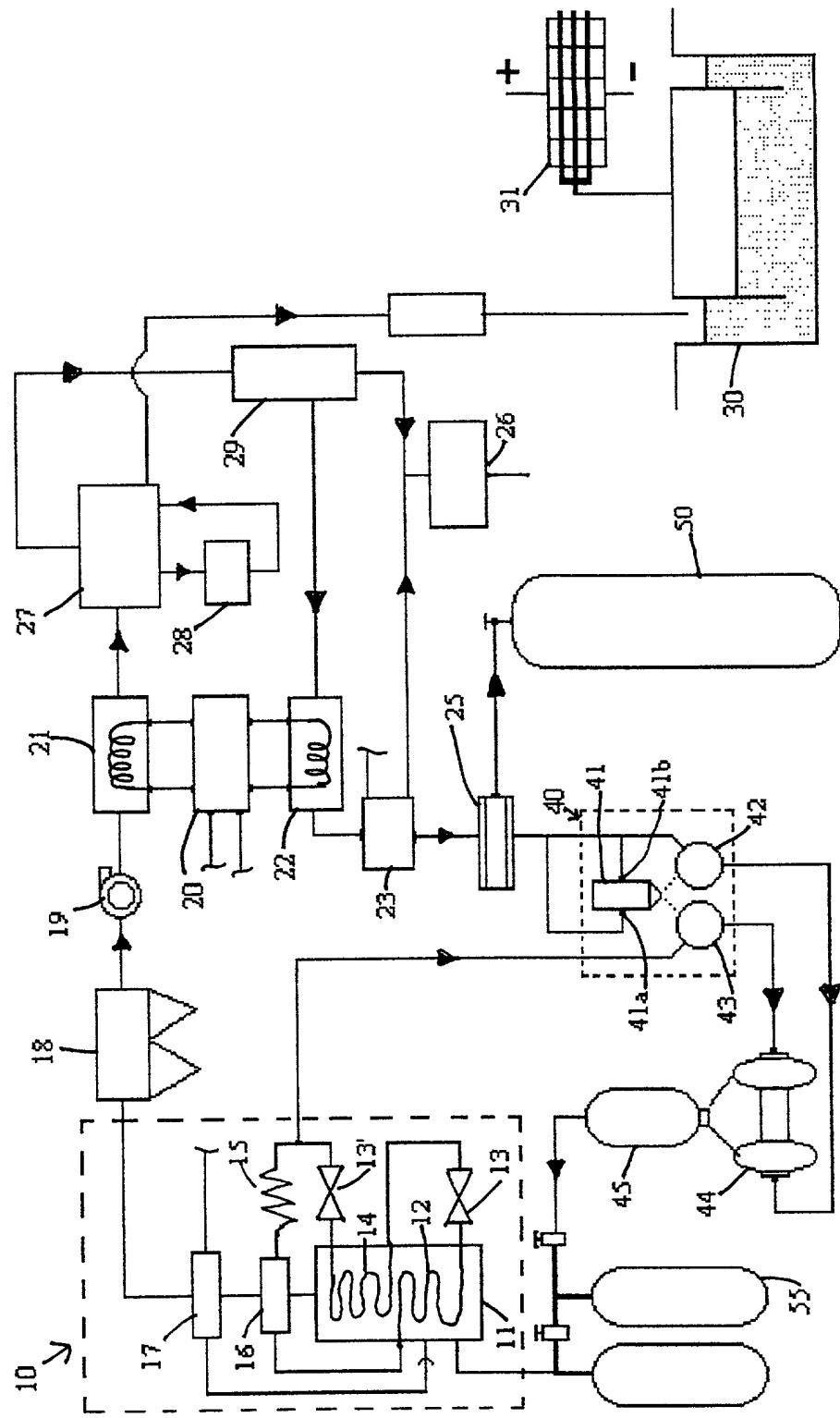
1    ABSTRACT OF THE INVENTION

2           An apparatus and method of converting flue gases  
3   produced by a fossil fuel burning furnace boiler is  
4   disclosed. The flue gas is separated into its constituent  
5   parts by cooling and filtering. Carbon dioxide, the main  
6   constituent, is then converted to carbon monoxide in a laser  
7   powered gas converter in which carbon is a catalyst. The  
8   laser powered converter also produces hydrogen from steam,  
9   and the two newly produced gases are chemically combined to  
10   produce a hydrocarbon fuel product which can then be burned  
11   in the furnace boiler. In this manner no harmful greenhouse  
12   gases are permitted to escape to the atmosphere.

13

14

15



**Figure 1**

FIGURE 2

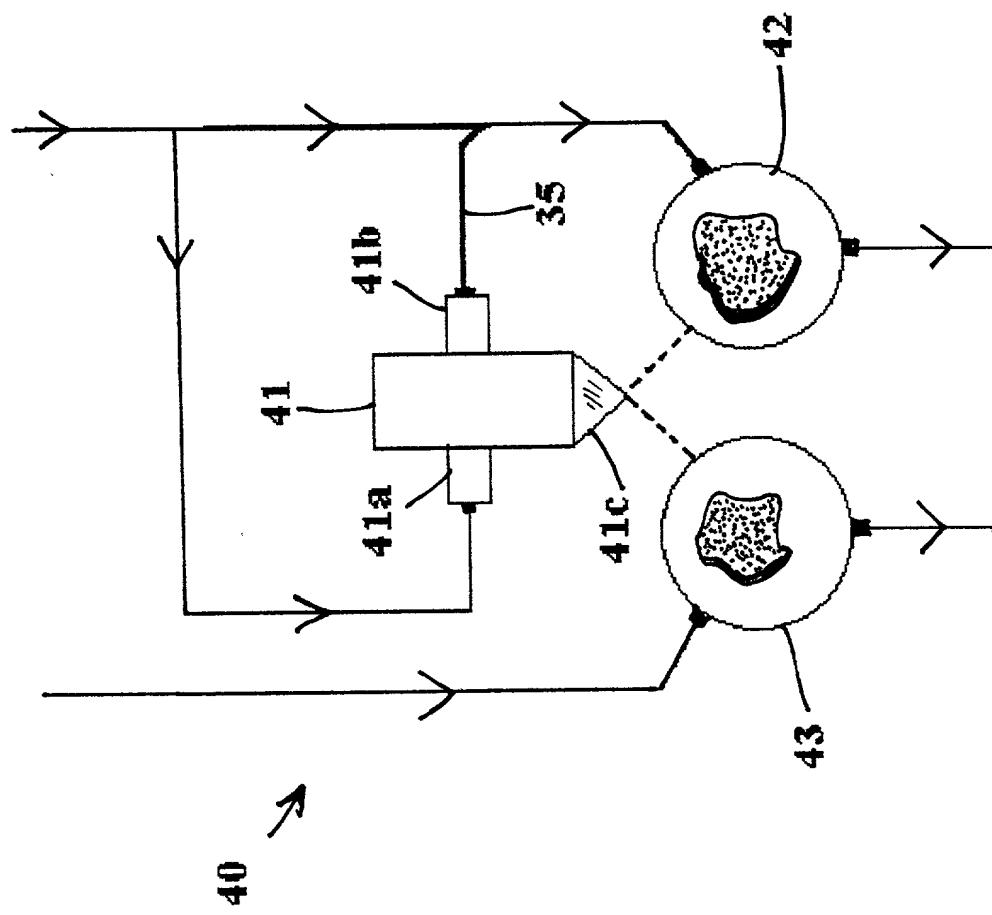
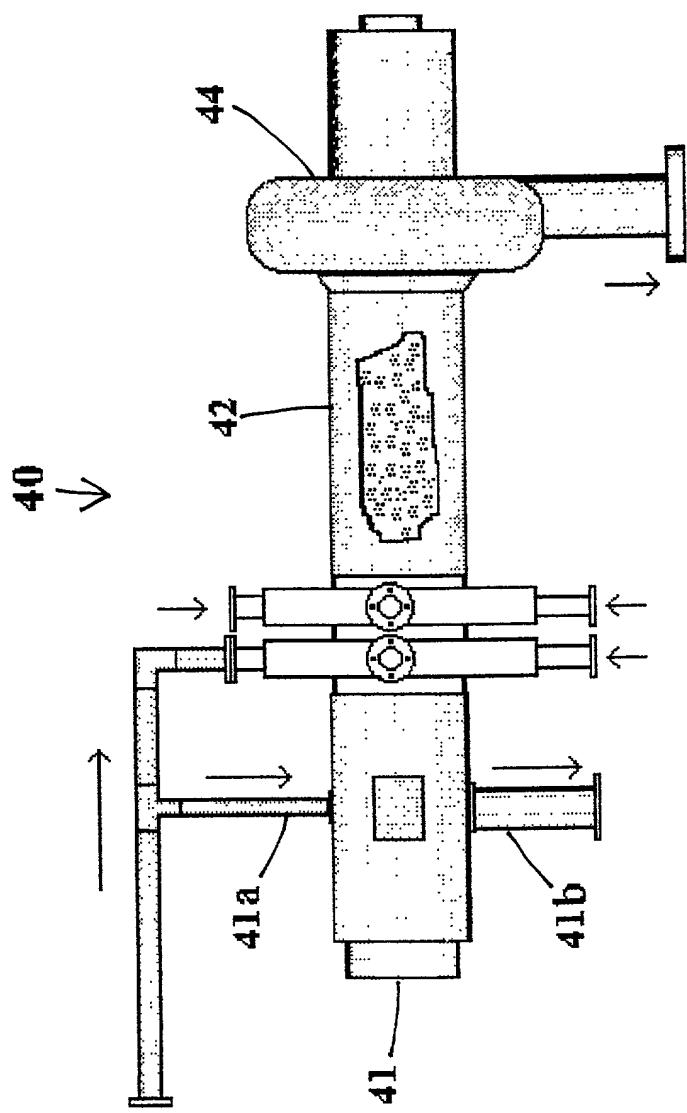


FIGURE 3



## **Declaration for Utility or Design Patent Application**

As a below-named inventor, I hereby declare that my residence, post office address, and citizenship are as stated below next to my name and that I believe that I am the original, first, and sole inventor [if only one name is listed below] or an original, first, and joint inventor [if plural names are listed below] of the subject matter which is claimed and for which a patent is sought on the invention, the specification of which is attached hereto and which has the following title:

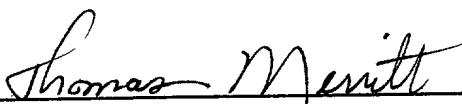
FLUE GAS CONVERSION APPARATUS AND METHOD

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to in the oath or declaration. I acknowledge a duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code, Section 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Please send correspondence and make telephone calls to the First Inventor below.

Signature: Sole/First Inventor:



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Print Name: \_\_\_\_\_ Date: \_\_\_\_\_

Residence: \_\_\_\_\_ Citizen Of: \_\_\_\_\_

Post Office Address: \_\_\_\_\_

Telephone: \_\_\_\_\_